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(54) **Process for extracting a liquid contained in a material, in particular grapes, and pressing assembly for implementing it**

(57) The process prescribes a vat (1) furnished with a screen (7) for separating liquid and solid, against which the material is pressed by an inflatable piston (12) so that the liquid flows through the screen, which piston can, when deflated, be introduced into the vat and inflated to

form a sliding transverse partition sealably dividing the vat into two compartments one of which, opposite the separation screen, can be closed to receive a pressure agent in order for the piston to compress the material.

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[figure]

Fig. 2

Description

The invention concerns the extraction of a liquid contained in a material, grapes for example, or from the pomace during wine making.

It is known that this extraction is generally accomplished by placing the material in a vat furnished with a screen for separating liquid and solid, against which screen the material is then pressed so that the liquid flows through the screen, the pressure being obtained, for example, by a worm gear, or pneumatically by means of a membrane.

The purpose of the invention is to make it possible to accomplish the extraction of the liquid in a way that is simple, convenient and economical, particularly with respect to the pressing of the material against the screen.

To that end, it proposes a process for extracting a liquid contained in a material, in which said material is introduced into a vat furnished with a screen for separating liquid and solid, against which the material is pressed so that the liquid flows through the screen, characterized in that provision is made for said vat and an inflatable piston to be adapted to cooperate in such a way that the piston, when deflated, can be introduced into the vat, and in such a way that when inflated in the vat, it can form a sliding transverse partition sealably dividing the vat into two compartments, the first of which contains the separation screen while the second can be closed to receive a pressure agent; the extraction of the liquid being accomplished by introducing the material into the vat followed by the deflated piston, then inflating said piston so that the material is located in said first compartment and by then injecting said pressure agent so that the inflated piston is applied to and presses against the material, the pressure agent then being evacuated from said second compartment, the piston deflated and removed from the vat, and the drained material removed from the vat.

The process proposed by the invention can be implemented without the need for means that are complicated to manufacture. An already existing vat can even be used by providing an appropriate inflatable piston pressure assembly, which is relatively economical because it only requires a few raw materials.

Moreover, because the inflatable piston can be completely removed from the vat, it is possible to clean the vat without being hindered by the presence of the pressure or compression means, so that this operation can be performed easily and quickly, which in addition minimizes the risk of not completely eliminating certain portions of the drained material, a feature that is particularly beneficial when the process is used in the preparation of a food product.

According to preferred characteristics of the invention, the piston is inflated to a pressure greater than the pressure under which the second compartment is placed when said pressure agent is injected therein.

This ensures that the piston remains properly inflated, and it preserves a certain rigidity that is useful to its proper operation.

According to other preferred characteristics, said vat is provided with said separation screen located at the bottom, and the material and inflatable piston are introduced from the top.

In this way, under the effect of gravity the material (introduced first) and the piston (introduced second) are positioned in the vat with the first compartment containing the material situated beneath the piston, and the second compartment situated above the first.

According to other preferred characteristics, the inflatable piston is introduced into the vat by the same opening as the material.

Thus, no special opening is needed for introducing the piston into the vat.

According to other preferred characteristics, said pressure agent is injected through a hatch in the second compartment of the vat.

This avoids the necessity of making a special orifice in the wall of the vat.

According to other preferred characteristics, flexible tubing is provided for the inflatable piston in order to feed or evacuate a pressure agent, said tubing passing through a hatch in the second compartment of the vat.

This avoids the necessity of making a hole in the wall of the vat for inflating or deflating the piston, the flexible tubing attached to the piston simplifying these operations because they can be controlled from outside the vat, and also the operations of inserting and extracting the inflatable piston, the flexible tubing then playing the part of a connecting element for handling the piston.

According to other preferred characteristics, for reasons of convenience and economy, a same inflatable piston is used for several similar vats.

The process that has just been set forth can be used with any type of materials containing liquid, but is particularly suited to grapes, at least part of which can then be used to make wine in the same vat by allowing it to remain therein until the pomace is floating on the liquid, then by opening a racking cock to allow this liquid to drain off, then by compressing with said inflatable piston the pomace as it was deposited after the drain-off of the first liquid in order to obtain a second liquid that is pressed from this pomace through said separation screen.

Depending on the situation, the period during which the grapes are at rest in the vat, where the different components of the grapes are in contact, makes it possible to obtain a simple

aromatic homogenization of the product with the possible extraction of the color, or a fermentation of all of it, the process according to the invention making it possible for a maximum amount of liquid to be obtained directly with the vat, that is, not only the first liquid that is separated spontaneously from the pomace, but also a second liquid obtained by compression of the pomace.

This second liquid, although it is obtained by pressing, is expressed from a pomace that has not undergone any mechanical crushing action whatever because it is placed under pressure directly in the state in which it was deposited after the first liquid was drained off.

As a result, the second liquid will not suffer from any of the harmful effects caused by crushing the pomace, resulting in a second liquid of very high quality.

According to other preferred characteristics, a conveying means is provided in the bottom of the vat to evacuate the drained material through an outlet provided for that purpose.

Thus, the need to extract this material manually is avoided.

It will be noted, in the event the process is used for making wine from grapes as set forth above, that the same vat is used for storage for wine making, maximum extraction of the juices with pneumatic compression, and emptying by mechanical means.

A second aspect of the invention also proposes a pressing assembly suitable for the implementation of the process that has just been set forth.

This pressing assembly is characterized in that it comprises an inflatable piston formed by an envelope of flexible, non-elastic material having two similar opposite end panels with an outer contour that corresponds to the transverse cross section of said vat and a side panel having two opposite edges each attached to the outer edge of one of the end panels, and by multiple links of the same length arranged between said end panels.

As a result of these links, when the piston is inflated it assumes, at least at the periphery, a nearly rectangular shape in the transverse cross section, and not a convex shape that would hinder its sliding in the vat and/or the seal of the separation between the two compartments it delimits.

According to preferred characteristics, said piston is completely inflatable, including at the center.

Such an inflatable piston, which does not comprise a simple panel of flexible material at the center, offers the advantage of being able to be inflated with relatively moderate pressure, and in any case a lower pressure than if it were not inflated at the center (if a single panel of flexible material were provided at the center, it would

tend, under the effect of the difference in pressure between the first and second compartments, to bulge toward the first compartment and thus decrease the diameter of the piston, making it necessary to provide strong pressure for the circular inflatable part located around the single panel).

The explanation of the invention will now be continued by a description of one embodiment thereof, given by way of non-limiting example, with reference to the appended drawings in which:

- figure 1 is a cross-sectional elevation of an empty maceration vat for the vintage;
- figure 2 is a similar view of this vat, after the vintage has been placed therein and macerated and/or fermented, the liquid that spontaneously separated from the pomace has been drained off, the inflatable piston has been inflated and placed above the pomace remaining in the vat, and the upper hatch of the vat has been closed;
- figure 3 is a diagrammatic view in perspective, with partial cutaway, showing the inflatable piston, and more generally the pressing assembly that is seen in place in the vat in figure 2; and
- figure 4 diagrammatically shows the valves and pressure regulators with which the assembly is furnished.

The vat 1 shown in figure 1 has an overall cylindrical shape with circular cross section. It is arranged vertically and rests on the floor on feet that are not represented. It comprises, at the top, an opening 2 through which the grapes are introduced, and inside, against its bottom 3, a rotor 4 with blades arranged coaxially in the vat, affixed to a drive shaft 5 which extends below the rotor, passes through the bottom of the vat and connects to a drive motor, not represented, that turns it as shown by the arrow 6; a screen 7 for separating liquid from solid arranged facing the bottom of the side wall of the vat 1, with which it defines a chamber 8 for collecting the liquid, the bottom of which chamber is furnished with a racking cock 9, the screen 7 converging toward the rotor 4, an outlet 10 closable by a cover 11 being placed at the ends of the blades of the rotor 4.

The vat 1 is used for vinification of the grapes by introducing them through the upper opening 2 until the vat is filled, the opening 10 being closed by the cover 11, the rotor 4 being stopped and the cock 9 closed.

As explained above, the grapes are allowed to rest for some time, until the pomace is floating on the liquid. The racking cock 9 is then opened and the liquid is allowed to drain off, after which the pomace rests on the bottom of the vat, on the

rotor 4 and on the screen 7, as shown in figure 2.

The piston 12 is then introduced through the opening 2 and placed above the pomace by means of the flexible tubing 13 to which it is connected, like a suspension link. This tubing is then connected to a source of compressed air, and the piston is inflated until it reaches the state shown in figure 2, where it forms a sliding transverse partition sealably dividing the vat 1 into a lower compartment where the pomace and the separation screen 7 are located, and an upper compartment which can be closed by the hatch 14 in order to receive the compressed air injected by means of the tube 15 that passes through the hatch 14, the upper compartment then being placed under pressure so that the piston is applied against the pomace and compresses it, a part of the liquid that it contains passing through the screen 7 and draining out of the vat 1 by passing through the cock 9.

When the liquid stops flowing, the cock 16 of the tube 15 is placed in the position in which the compressed air from the upper compartment can escape; it is possible to wait for a time, then place the upper compartment of the vat under pressure again, one or more times, then deflate the piston 12 by evacuating the compressed air with which it was inflated using the valve 17 (figure 4) that is placed in the position in which it places the interior of the piston 12 in communication with the exhaust, and the piston 12 is extracted from the vat, and more generally the pressure assembly that also comprises the tubing 13, the tube 15 and the hatch 14.

The outlet 10 is then opened by removing the cover 11, and the rotor 4 is turned so that the drained pomace is evacuated through the outlet 10.

The pressure assembly used in the vat 1 will now be described in greater detail, using figures 3 and 4.

As can be seen in figure 3, the inflatable piston 12 is formed by an envelope of flexible non-elastic material formed into a sort of mesh of the type with which pneumatic boats are made, this envelope having two similar opposite end panels 20 and 21 with an outer contour that corresponds to the transverse cross section of said vat 1, and a side panel 22 the upper and inner edges of which are each attached to the outer edge of the panel 20 or the panel 21, multiple links 23 (not represented in figure 2) of the same length arranged between the panels 20 and 21, which allows said panels to remain parallel when the piston has been inflated, as shown in figure 2, and the panel 22 to be at approximately a right angle with respect to the panels 20 and 21.

In addition to the inflatable piston 12, the pressure assembly comprises the flexible tubing 13, the tube 15, the hatch 14, the pressure regulators 18 and 19 (figure 4) arranged

respectively on the tubing 13 and the tube 15, and the three-way cocks 16 and 17 placed respectively in the tube 15 and the tubing 13, each of which is connected to a tube 25 intended to be connected to a source of compressed air.

Each of the cocks 16 and 17 has three positions in which the part of the tubing situated downstream of the cock is respectively isolated, in communication with the upstream part of the tubing, and exhaust. The position of communication with the downstream part of the tubing is used to inflate the piston 12 or to place the upper compartment of the vat 1 under pressure, the isolated position is used to keep the piston inflated or the upper compartment under pressure, and the position of communication with the exhaust is used to deflate the piston 12 or to remove the pressure from the upper compartment of the vat.

The pressure regulators 18 and 19 (not represented in figures 2 and 3) are used to set respectively the pressure at which the piston 12 is inflated, and the pressure to which the upper compartment of the vat is brought, the latter pressure being less than the former in order for the piston to remain inflated in operation. By way of example, the inflation pressure of the piston can be set between 0.5 and 1 bar, and the upper compartment of the vat can be brought to a pressure 0.1 to 0.2 bar less than the inflation pressure of the piston.

Depending on the circumstances numerous variations are possible, and in particular the vat and the inflatable piston can be fitted out differently.

In this respect, the invention is not limited to the examples described and represented.

40 Claims

1. Process for extracting a liquid contained in a material, in which said material is introduced into a vat (1) furnished with a screen (7) for separating liquid and solid, against which the material is pressed so that the liquid flows through the screen (7), characterized in that provision is made for said vat (1) and an inflatable piston (12) to be adapted to cooperate in such a way that the piston (12), when deflated, can be introduced into the vat (1), and in such a way that when inflated in the vat, it can form a sliding transverse partition sealably dividing the vat into two compartments, the first of which contains the separation screen (7) while the second can be closed to receive a pressure agent; the extraction of the liquid being accomplished by introducing the material into the vat followed by the deflated piston (12), then inflating said piston so that the material is located in said first compartment and by then

injecting said pressure agent so that the inflated piston is applied to and presses against the material, the pressure agent then being evacuated from said second compartment, the piston (12) deflated and removed from the vat (1), and the drained material removed from the vat.

2. Process according to claim 1, characterized in that the piston is inflated to a pressure greater than the pressure under which the second compartment is placed when said pressure agent is injected therein.
3. Process according to either of claims 1 or 2, characterized in that said vat (1) is provided with said separation screen (7) located at the bottom, and the material and inflatable piston (12) are introduced from the top.
4. Process according to any of claims 1 to 3, characterized in that the inflatable piston (12) is introduced into the vat by the same opening (2) as the material.
5. Process according to any of claims 1 to 4, characterized in that said pressure agent is injected through a hatch (14) in the second compartment of the vat (1).
6. Process according to any of claims 1 to 5, characterized in that flexible tubing (13) is provided for the inflatable piston (12) in order to feed or evacuate a pressure agent, said tubing (13) passing through a hatch (14) in the second compartment of the vat (1).
7. Process according to any of claims 1 to 6, characterized in that a conveying means (4) is provided in the bottom of the vat (1) to evacuate the drained material through an outlet (10) provided for that purpose.
8. Process according to claim 7, characterized in that said conveyor means comprises a rotor (4) with blades coaxial to the vat (1), said outlet (10) being placed at the ends of the blades of the rotor 4.
9. Process according to either of claims 7 or 8, characterized in that said separation screen (7) is arranged facing the bottom of the side wall of the vat (1), with which it defines a chamber (8) for collecting the liquid, which chamber is furnished with a racking cock (9), said screen (7) converging toward the conveyor means (4).
10. Process according to any of claims 1 to 9, characterized in that a same inflatable piston (12) is used for several similar vats (1).

- 5 11. Process according to any of claims 1 to 10, characterized in that said material is grapes that are made into wine in said vat by allowing it to remain therein until the pomace is floating on the liquid, then by opening a racking cock to allow this liquid to drain off, then by compressing with said inflatable piston the pomace as it was deposited after the drain-off of the first liquid in order to obtain a second liquid that is pressed from this pomace through said separation screen (7).
- 10 12. Pressing assembly suitable for implementing the process according to any of claims 1 to 11, characterized in that it comprises an inflatable piston formed by an envelope of flexible, non-elastic material having two similar opposite end panels (20, 21) with an outer contour that corresponds to the transverse cross section of said vat (1) and a side panel (22) having two opposite edges each attached to the outer edge of one of the end panels (20, 21), and by multiple links (23) of the same length arranged between said end panels (20, 21).
- 15 13. Assembly according to claim 12, characterized in that said piston (12) is completely inflatable, including at the center.
- 20 30 14. Assembly according to either of claims 12 or 13, characterized in that it comprises flexible tubing (13) for feeding or evacuating a pressure agent into or out of the inflatable piston (12), as well as a hatch (14) of said vat (1) through which said tubing (13) passes.
- 25 35 40 45 50 55 60 15. Assembly according to claim 14, characterized in that said hatch (14) also has a tube (15) passing through it to inject or evacuate a pressure agent into or out of the second compartment, each of said tubes (13, 14) [sic] intended to be connected to a source of pressure agent through a cock (16, 17) and a pressure regulator (18, 19).

[figure]

Fig. 1

[figure]

Fig. 2

[figure]

Fig. 3

[figure]

Fig. 4

<u>DOCUMENTS CONSIDERED PERTINENT</u>		Claims concerned from the examined application	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
Category	Citation of the document with indication, if needed, of the pertinent parties		
A	EP-A-0 193 147 (ENGEL) * abstract; figures ---	1, 12	B30B9/04 B30B9/22 B30B15/06
A	EP-A-0 310 842 (PASSAT-MASCHINENBAU GMBH) * claims; figures *	1, 12	
A	FR-A-2 567 385 (TROCCAZ) * claims; figure *	1	
		TECHNICAL DOMAINS SEARCHED (Int. Cl 6)	
		B30B D06F	
This report has been established for all of the claims.			
Place where search was made THE HAGUE	Date of Completion of Search September 18, 1995	Examiner K. Voutsadopoulos	
CATEGORY OF DOCUMENTS CITED			
X: particularly pertinent to [illegible]		T: [illegible]	
Y: particularly pertinent in combination with another document of the same category		K: [illegible]	
A: technological background		D: [illegible]	
O: [illegible]		L: [illegible]	
P: document [illegible]		
		•: member of the same family, [illegible]	